REMARKS

This is a divisional application of Application No. 08/863,468 filed May 27, 1997.

Claims 13 through 28 are pending, with Claims 13 and 23 being independent. Claims 1 through12 and 29 through 33 have been cancelled without prejudice.

The specification has been amended in the same manner as the parent application. No new matter has been added.

Early and favorable consideration hereof is earnestly solicited.

Applicants' undersigned attorney may be reached in our Washington, D.C. office by telephone at (202) 530-1010. All correspondence should continue to be directed to our below-listed address.

Respectfully submitted,

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MARKED-UP VERSION SHOWING CHANGES MADE TO SPECIFICATION

The paragraph at page 1 lines 7 through 12 has been amended as follows.

--In recent years, [along with] the improvements in the performance of color copying machines and color [printers] printers have been so great that, they may be successfully used in illegal applications. It is almost impossible to [specify] trace an illegally used copying apparatus or its operator [in accordance with a copy] from the illegal copies made therefrom.--

The paragraph at page 1, lines 13 through 18 has been amended as follows.

--To prevent illegal copying, the following countermeasure has been attempted. A specific image pattern is registered in a color copying machine or a color printer itself beforehand, [a] and when the pattern on an original is identified by the copying machine or printer, [to forcibly inhibit illegal] copying is inhibited.--

The paragraph at page 1, lines 19 through 24 has been amended as follows.

--In this case, a circuit for [determining] identifying a specific original is used in the color copying machine or color printer. The number of image patterns to be registrable in this circuit is limited. It is, therefore, impossible to register all kinds of originals to be discriminated.--

The paragraph starting at page 1, line 25, and ending at page 2 line 19 has been amended as follows.

--[In] Moreover, in a color copying machine or printer having an external interface, such a circuit for determining a specific original, may not properly function. For example, when image data on the external interface are simultaneously sent as three primary data, i.e., red, green, and blue data, the above determination circuit can be properly operated. However, if image data on the external interface are data such as cyan, magenta, yellow, and black data corresponding to the individual characteristics of a printer, different color-reproducible combinations are present, and a plurality of the types of image patterns for [determining] identifying specific originals are required. It is very difficult to even [determine] identify and detect a specific original, and the number of images of determinable specific originals is limited. In addition, when image data for expressing the respective color components are surface-sequentially sent in units of colors, image data must be stored in a memory [for determination to result in] to perform the identification, which results in the use of a high cost memory, thereby requiring a high cost for [determining] identifying a specific original.--

The paragraph starting at page 2 line 20 and ending at page 3 line 2 has been amended as follows.

--Assume that the above problem [on] relating to the image data sent from the external interface is solved. Even if the number if specific originals as target objects is limited to the number of recognizable objects, a picture very similar to a registered specific original may be

erroneously determined, or a stained specific original [is] may be erroneously determined not to be a specific original. It is impossible to avoid such an error.--

The paragraph at page 3, lines 3 through 9, has been amended as follows.

--It is important to add a means for detecting a specific original in the color copying machine or printer. When an original which is not supposed to be copied is copied, it is important to specify the illegally used copying machine or its operator because the detection capability for identifying specific originals is limited.--

The paragraph at page 3, lines 10 through 23, has been amended as follows.

--Under there circumstances, a technique for adding, to an original image, information which can [specify] identify an illegally used copying machine or its operator, has been [taken into consideration] developed. According to this technique as [dislcosed] disclosed in U.S. Patent Application Serial No. 07/799,608, of all output color components (e.g., magenta, cyan, yellow, and black) of a copying machine, [an] the output color component (e.g., yellow) which is least noticeable to the human eye is used to modulate (e.g., addition of a predetermined value) the image signal of this output color component. A numeric value or code representing the manufacturing number of the copying machine is formed repeatedly on a reproduced image to every predetermined interval.--

The paragraph starting at page 3, line 24 and ending at page 4, line 8 has been amended as follows.

--In a system proposed along with the developments of performance of color copying machines, and particularly, color readers and configured such that a reader is arranged independently of a printer [and] so that a third party can easily disconnect the reader from the printer, [a memory unit for] decoding an interface between the reader and the printer with a memory unit and its architecture (e.g., a communication method), fetching an image from the reader, and outputting the decoded data and the fetched image to another printer or computer [is] has been developed to obtain an illegal benefit in practice.--

The paragraph at page 4, lines 9 through 15 has been amended as follows.

--[In] With the above technique, however, although yellow is the output color component which is least noticeable to the human eye, modulation of the corresponding image signal must be minimized. In particular, for example, in a color copying machine [is] used in the fields of design, a problem is posed when a pattern which is not present in an original is noticeable on a reproduced image.--

The paragraph at page 4, lines 16 through 25 has been amended as follows.

--In copying an original, image signals are not necessarily uniform due to variations in sensitivities of a CCD sensor even if a uniform color original is used. When an image in a host

computer is printed out using the external interface of a color copying machine, CG (computer graphics) data can be directly output, and a uniform range of image signal levels is necessarily present. At this time, when the yellow component is modulated, an additional pattern undesirably tends to be noticed in a uniform light gray or blue portion or the image.--

The paragraph at page 5, lines 1 through 12 has been amended as follows.

--In a method of defining a numeric value or code representing additional information as a unit pattern and forming an additional pattern by repeating the unit pattern every predetermined interval, the unit pattern is regularly localized and tends to be notice with the human [eye. The] because the human eye can more easily recognize a regular pattern than a random pattern. When the unit pattern is arranged in a matrix form, it tends to be noticed with the human eye. For this reason, the degree of modulation of the image signal must be inevitably reduced, and additional information may not be read depending on the types of specific originals.--

The paragraph starting at page 5, line 25 and ending at page 6, line 7 has been amended as follows.

--It is another object of the present invention to provide an image processing apparatus capable of providing a countermeasure for the trend of the supply of the above-mentioned memory unit in such a manner that image information is modulated by an image input means such as an image reader and the image information is demodulated (to be referred to as encryption hereinafter) by an image output means such as a printer or display.--

The paragraph at page 6, lines 12 through 26, has been amended as follows.

--On the other hand, there is an apparatus in which a pattern is not added in a pattern added unless a main controller of the apparatus accesses the pattern adder during initialization of the apparatus when apparatus detection is to be performed by adding the pattern to a reproduced image, so that an image (video) flows without any addition. In this case, assume that a copying machine of a new model is realized by assigning a pattern addition function to a copying machine of an old model. If the program of the copying machine of the old model, i.e., a program ROM_1 is mounted in the copying machine of the new model, and this copying machine is started, pattern addition is not performed. That is, only a normal image is output, i.e., a so-called loophole is formed.--

The paragraph at page 8, lines 4 through 12 has been amended as follows.

--In [the] a copying machine or this type, when an [addition of pattern] a pattern, which represents the manufacturing number of the machine and the like is added to the image before the above processes are performed, the pattern is affected by the processes. As a result, the pattern may not be read. It is, therefore, still another object of the present invention to provide an image processing apparatus capable of performing pattern addition free from the influences of these processes.--

The paragraph starting at page 17, line 21 and ending at page 18, line 7 has been amended as follows.

--Fig. 2 is a block diagram showing the circuit arrangement of the image scanner 201 according to the first embodiment. Referring to Fig. 2, the CCD line sensor 210 has R, G, and B spectral sensitivity characteristics. Reference numeral 101 denotes an A/D & S/H circuit for performing A/D conversion and a sample/hold operation. Reference numeral 102 denotes a shading correction circuit; [103,] 103 denotes a timing correction circuit; [104,] 104 denotes an input masking circuit; [105,] 105 denotes a LOG converter; [106,] 106 denotes a masking•UCR (undercolor removal) circuit; [107,] 107 denotes a γ-correction circuit; [108,] 108 denotes an MTF correction circuit; [109,] 109 denotes a pattern addition circuit; and [110,] 110 denotes a modulator.--

The paragraph at page 19, lines 4 through 17 has been amended as follows.

--The pattern addition circuit 109 performs a process for adding, to a copy image, a pattern which is difficult to identify with a human eye and representing the number such as the manufacturing number, [dedicated] assigned to the machine. The modulator 110 is a circuit for encryption and is constituted by, e.g., a ROM or RAM and its peripheral circuits. The memory contents of the ROM or the RAM can be obtained by a one-to-one correspondence function generated by a known random generation formula in the input range of 0 to 255 and the output range of 0 to 255 if the length of a video signal is defined as 8 bits. Modulation by the modulator 110 may be performed by a so-called texture process which is [dislcosed] disclosed in U.S. Patent No. 5,021,876.--

The paragraph at page 20, lines 8 through 24 has been amended as follows:

--Reference numeral 703 denotes a γ-correction circuit in the printer and is constituted by a ROM or RAM and its peripheral circuits. The γ-correction circuit 703 corrects a change in density at the printer, which is caused by an environmental variation. By this correction control, a constant output can be obtained regardless of the environmental variation. An output having a dot pattern which can be properly read by a given technique can be obtained although this pattern cannot be generally discriminated with the human eye. A D/A converter 704 converts a video signal into an analog signal. Reference numeral 705 denotes a PWM (pulse width modulation) modulator for [PWM-modulates] PWM-modulating the analog signal and sending the modulated signal to a laser drier 706. The laser driver 706 drives the semiconductor laser 213 in accordance with the M, C, Y, and Bk video signals sent from the PWM modulator 705.--

The paragraph at page 21, lines 1 through 8, has been amended as follows.

--Fig. 3 is a block diagram showing the arrangement of the pattern addition circuit 109 according to the first embodiment. Referring to Fig. 3, reference numeral 301 denotes a subscanning counter; [302,] 302 denotes a main scanning counter; [303,] 303 denotes a look-up table RAM (to be referred to as an LUT hereinafter); [304,] 304 denotes an AND gate; [305,] 305 denotes a flip-flop; [306,] 306 denotes an inverter; [307,] 307 denotes an AND gate; [308,] 308 denotes a register; [309,] 309 denotes and an AND gate; and [310,] 310 denotes an adder.--

The paragraph at page 22, lines 7 through 16, has been amended as follows.

--The level (modulation amount) of a pattern to be added is stored in the register 308 set by the CPU 313. The AND gate 309 validates this level only when CNO is 2 (printing in yellow). The pattern is then added to image data V by the adder 310. Reference numeral 311 denotes an AND gate; and [312,] 312 denotes a resister set by the CPU 313. The register 312 becomes 0 when it is reset. Therefore, unless the pattern addition circuit is accessed by the CPU 313, an input video signal is modulated and is output with a fixed value of "0".--

The paragraph starting at page 22, line 23 and ending at page 23, line 10 has been amended as follows.

--A dot pattern 400 shown in Fig. 4, i.e., an additional pattern is held in the LUT 303. One square in Fig. 4 corresponds to one bit held in the LUT 303. A white square represents "0", and a black square represents "1". The horizontal direction corresponds to lower four bits of the address, and the vertical direction corresponds to upper four bits of the address, thereby forming the additional pattern using a total 256 bits. A line having the address upper bits of 0 (i.e., the uppermost line) in Fig. 4 is a mark representing a reference position. Meshed portions in Fig. 4, i.e., six lines having the address upper bits of 2, 3, 8, 9, E, and F are used [for] every two lines [for] representing dots.--

The paragraph starting at page 24, line 16 and ending at page 25, line 2 has been amended as follows.

--Referring to Fig. 5, reference materials 501 denote added patterns. The content of the additional pattern stored in the LUT 303 are added as an image. In the pattern shown in Fig. 5, each pattern representing "3FC" is added in a pattern of 32 pixels x 32 pixels so as to make it difficult for the human eye to identify the pattern. This patten is repeated every 128 pixels in the main scanning direction and 128 lines in the subscanning direction. If each pattern represents the manufacturing number assigned to a specific apparatus or represents a code representing the manufacturing number, the apparatus used can be [specified] identified by checking the copy.--

The paragraph at page 25, lines 10 through 16, has been amended as follows.

--According to a method using the above-mentioned additional pattern, a method of using a pattern shown in Fig. 6A makes it possible to [more] further reduce the number of pixels subjected to modulation and to cause the human eye to notice the pattern less than a method of modulating an image signal directly using numerical values, as shown in Fig. 6B.--

The paragraph starting at page 25, line 17 and ending at page 26, line 2 has been amended as follows.

--As described above, a prescribed additional pattern for [specifying] identifying an apparatus used is recorded on a copy in a combination of a mark representing the positional reference and a pattern consisting of at least one dot. The number of pixels subjected to modulation can be reduced, and the additional pattern becomes unnoticeable. For this reason, degradation of image quality of the copy can be prevented. In addition, since conversion of an

additional pattern into a dot arrangement pattern is a kind of encryption[. Therefore], this patten can hardly be intentionally manipulated by a third party.--

The paragraph at page 26, lines 3 through 8 has been amended as follows.

--Another feature of the apparatus according to this embodiment lies in the fact that the modulator 110 and the frequency converter 701 which constitute the encryption circuit are connected to the output of the pattern addition circuit. Pattern addition independent of encryption can be realized.--

The paragraph starting at page 26, line 19 and ending at page 27, line 4 has been amended as follows.

--A specific pattern added on a copy to [specify] identify an apparatus is represented in the form of distributed dots and is set unnoticeable, thereby minimizing degradation of image quality. Conversion of this additional information into a dot arrangement pattern is a kind of encryption, and the pattern can hardly be intentionally manipulated. In addition, a pattern free from an environmental variation can be added. Since the printer has a gradation process section, pattern addition free from the environmental variation can be realized without performing a cumbersome operation such as communication between the reader and the printer.--

The paragraph at page 28, lines 9 through 16 has been amended as follows.

--[Assume] Consider a ROM of an old model and a ROM of a new model. A program stored in the ROM of the old model does not include a sequence of the pattern addition described above. No sequence for setting "1" in the register 312 is available. To the contrary, a program stored in the ROM of the new model has a sequence of the pattern addition described above. When the system is powered on, "1" is set in the register 312.--

The paragraph at page 28, lines 17 through 21 has been amended as follows.

--[In] During a ROM replacement or power-ON operation, if the register 312 is reset, blank paper reproduction is performed by the ROM of the old model, while normal pattern addition is performed by the ROM of the new model.--

The paragraph starting at page 30, line 20 and ending at page 31, line 3 has been amended as follows.

--In this γ-correction circuit, γ-correction characteristics can be selected in accordance with three linear expressions (1) to (3) in accordance with an input video signal. The registers 803 to 805 can set a gradient of 0 to 8 times every 1/32 step. The registers 806 to 808 [represents] represent a y-intercept falling within the range of -100H to +FFH. Reference numeral 813 denotes a 0-limiter; and [814,] 814 denotes an FF-limiter. An area to which input data belongs is determined by the registers 816 and 817, the comparators 818 and 819, and the PAL 820.--

The paragraph at page 32, lines 20 through 25 has been amended as follows.

--According to this modification, the magnification circuit is connected to the input of the pattern addition circuit, and pattern addition independent of a magnification process, i.e., pattern generation independent of a magnification factor can be realized. [The] By this arrangement, the following problems can be solved.--

The paragraph at page 33, lines 6 through 8 has been amended as follows.

--(2) If a magnification factor is, e.g., 400%, the dot area becomes 16 times larger to cause a user to visually notice the pattern.--

The paragraph at page 45, lines 19 through 21, has been amended as follows.

--Fig. 29 is a view showing the relative sensitivities corresponding to the wavelengths of light beams on the CCD(R) 1301, the CCD(G) 1302, and the CCD(B) 1303.--

The paragraph starting at page 45, line 22 and ending at page 46, line 7 has been amended as follows.

--Fig. 30 is a block diagram showing the arrangement of a signal processor (image processing unit) 211. Referring to Fig. 30, reference numeral 3204 denotes an original; [3101,] 3101 denotes an additional pattern image correction circuit; [3102,] 3102 denotes a pattern

addition circuit; [3103,] 3103 denotes a controller for generating and outputting a vertical sync signal (VSYNC), a horizontal sync signal (HSYNC), and a clock (CLK) signal; [3402,] 3402 denotes a color signal processor; [3104,] 3104 denotes a CPU for controlling the overall apparatus; [3104a,] 3104a denotes a ROM for storing programs for operating the CPU 3104; and [3104b,] 3104b denotes a RAM serving as a work area of each block in the ROM.--

The paragraph at page 47, lines 10 through 15 has been amended as follows.

--Fig. 31 is a block diagram showing the additional pattern image correction circuit 3101. Referring to Fig. 31, reference numeral 3501 denotes a dot determination unit; [3502,] 3502 denotes a color determination unit; [3503,] 3503 denotes a NAND gate; 3504 to [3506,] 3506 denotes OR gates; and 3507 to [3510,] 3510 denote one-line delay line buffers.--

The paragraph at page 48, lines 6 through 12 has been amended as follows.

--Fig. 32 is a block diagram showing the arrangement of the color determination unit 3502. Referring to Fig. 32, reference numeral 3601 denotes an L*a*b* converter; 3602 and [3604,] 3604 denote comparators for comparing an L* signal with different threshold values C0 and C1, respectively; [3603,] 3603 denotes a look-up table (to be referred to as an LUT hereinafter); and [3605,] 3605 denotes an AND gate.--

The paragraph at page 49, lines 5 through 12 has been amended as follows.

--Referring to Fig. 33, reference numeral 3701 denotes a dot detector; 3702 and [3703,] 3703 denote line buffers for delaying a pixel and a line; [3704,] 3704 denote a frequency divider for 1/4-dividing the horizontal sync signal HSYNC to generate an HS4 signal. The dot determination unit 3501 performs extraction of a dot portion using the B signal having a high sensitivity to a yellow image so as to detect a yellow dot.--

The paragraph at page 51, lines 5 through 13 has been amended as follows.

--Referring to Fig. 42, reference numerals 1601 and 1602 denote add-on lines which are adjacent to each other in the subscanning direction. Reference numerals 1601a, 1601b, and 1602a denote unit dots. To prevent the unit dots of the add-on lines from being noticed with the human eye, the unit dots of the adjacent add-on lines are spaced apart from each other by an [internal] interval of at least d3 (e.g., 32 pixels) in the main scanning direction.--

The paragraph at page 52, lines 17 through 26 has been amended as follows.

--A dot interval in the main scanning direction of an additional patten and a repetition interval of all additional information in the subscanning direction must be determined such that all information can be properly added in a uniform area having a sufficient width [enough] to properly identify the dots in a specific original as a target object. As a criterion for this, pitch

information, at ½ or less than the width of the uniform area, can be added to the specific original as the target object so as to properly identify the dots.--

The paragraph starting at page 55, line 20 and ending at page 56, line 3 has been amended as follows.

--Referring to Fig. 44A, an AND unit 1832 receives, e.g., an 8-bit modulation amount α from a register 1831 and the output from the AND gate 1830 (Fig. 44B). Since the output from the AND gate 1830 goes to the "H" level at the timing of an add-on line dot period, and the AND unit 1832 outputs the modulation amount α at the timing of the add-on line dot period. Therefore, pixels except for the add-on line dot are not modulated because the modulation amount represented by the output form the AND unit 1832 is set at 0.--

The paragraph at page 56, lines 4 through 13 has been amended as follows.

--Reference numeral 1833 denotes an addition unit; and [1835,] 1835 denotes a subtraction unit. For example, an 8-bit image signal B is input to a terminal A of each of the addition unit 1833 and the subtraction unit 1835. The modulation amount α output form the AND unit 1832 is input to a terminal B of each of the addition unit 1833 and the subtraction 1832. An output (A + B) from the addition unit 1833 is input to an OR gate 1834, and an output (A - B) from the subtraction unit 1835 is input to an AND gate 1837.--

The paragraph at page 59, lines 14 through 18 has been amended as follows.

--In this modification, image data of yellow dot portions in an original is smoothed and printed to reduce degradation of the quality of a copied image, thereby properly detecting an additional code in the copied image.--

The paragraph starting at page 61, line 22 and ending at page 62, line 2 has been amended as follows.

--The present invention may be applied to a system constituted by a plurality of [equipments] pieces of equipment or to an apparatus consisting of one piece of equipment. The present invention is also applicable to a case wherein a program is supplied to the system or apparatus to achieve the present invention.--